Why not an engineering for non-engineered systems? : An approach to mitigating natural disasters worldwide.

AUTHOR(S):

Nishijima, Kazuyoshi

CITATION:

Nishijima, Kazuyoshi. Why not an engineering for non-engineered systems? : An approach to mitigating natural disasters worldwide.. 外国向け研究紹介冊子 Kyoto University Research Activities 2014, 4(2): 20-20

ISSUE DATE:

2014-09

URL:

http://hdl.handle.net/2433/190433

PHILIPPINES

Why not an engineering for non-engineered systems?

An approach to mitigating natural disasters worldwide.

Figure 1 House along the coastline of Leyte Island

Much effort and funding have been used to expand the frontiers of engineering such as in the fields of architecture and civil engineering, as realized in the construction of high-rise buildings, long-span bridges, large-space structures, and wide-spread lifelines. Being vehicles of economic growth and also playing a role as iconic symbols of technological development, these stand out in society. And thanks to their careful design and construction they seldom fail in the event of a natural hazard — at least in developed countries.

Turing our eyes to natural disaster statistics worldwide, however, we see another picture. Many disasters occur on the opposite side of the "engineering frontier". Indeed, these disasters are often associated with failures of buildings and infrastructure systems that are empirically designed and constructed without relying on engineering knowledge (Figures 1). In some cases, it is even fair to say that there is no such engineering knowledge available (Figure 2). This leads to the question: Why not an engineering for non-engineered systems? This is the starting point of my research.

Funded by Kyoto University as part of the SPIRITS (Supporting Program for Interaction-based Initiative Team Studies) program, my team has been developing an international research network with the ultimate goal of extending our engineering body of knowledge to include non-engineered systems, thereby providing engineering solutions to mitigate failures of such non-engineered systems. So far, the network consists of members from more than 11 organizations — research institutes, engineering societies, and non-governmental organizations — in nine countries. Aside from this SPIRITS project, I am also leading a project within the J-RAPID program funded by the Japan Science and Technology Agency for the reconstruction of areas of the Philippines struck by Typhoon Yolanda in 2013 (Figure 3). A case study of this J-RAPID project has, among other purposes, also addressed the need to develop engineering knowledge for non-engineered structures.

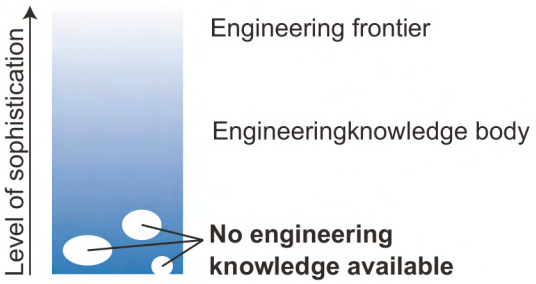

Figure 2 Our engineering body of knowledge.

Figure 3 House under reconstruction by residentsafter Typhoon Yolanda

To improve implementation, I think it is important not to lose traditional, cultural, and societal continuity in improving the performance of these non-engineered systems, and moreover I would personally feel bored if these non-engineered systems lost their unique, local characteristics and were simply replaced by technologies we can see anywhere in cities like Tokyo or New York. Instead, why don't we dream of high-performance bamboo houses on the coastline of Leyte Island or high-rise timber buildings in the city of Yangon?

Kazuyoshi Nishijima, PhD
Associate Professor, Disaster Prevention Research Institute
WEB www.taifu.dpri.kyoto-u.ac.jp/en/